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in response to the linear flow of the mud down the centre of the drill string.

All mud alternators effectively run open loop. This means
5 that the output voltage of the mud alternator is entirely dependant on the mud flow rate and is zero when there is no mud flow and at a maximum when the mud flow is at its maximum. This highly variable output voltage characteristic is completely unsuitable for drilling instrumentation, and
10 especially unsuitable for use in electromagnetic telemetry techniques.

It is an object of the present invention to provide a communication system capable of fulfilling at least some of
15 the above requirements.

According to the present invention there is provided a communication system for down hole use and comprising a drill collar comprising a first portion and a second portion
20 separated from each other by an electrically insulating material and means for generating an electrical signal and for applying the electrical signal to the drill collar such that the electrical signal is transmitted into a geological formation being drilled, wherein the means for generating the
25 electrical signal comprises an alternator and means responsive to an electrical output of the alternator for regulating rotation of the alternator.

The means responsive to the electrical output of the
30 alternator may comprise a torque generating apparatus which generates torque or a torque reaction in response to the electrical output of the alternator and which is mechanically connected to the alternator for transmitting such torque to the alternator for regulating rotation thereof.

CLAIMS

1. A communication system for down hole use and comprising a drill collar (101) comprising a first portion (103) and a 5 second portion (105) separated from each other by an electrically insulating material (67) and means (22, 63, 77, 81) for generating an electrical signal and for applying the electrical signal to the drill collar (101) such that the electrical signal is transmitted into a geological formation 10 being drilled, characterised in that the means for generating the electrical signal comprises an alternator (22, 63, 77, 81) and means (2, 4, 10) responsive to an electrical output of the alternator for regulating rotation of the alternator.

15 2. A communication system as claimed in claim 1, characterised in that the means responsive to the electrical output of the alternator comprises a torque generating apparatus (2, 4, 10) which generates torque in response to the electrical output of the alternator and which is 20 mechanically connected to the alternator for transmitting such torque to the alternator for regulating rotation thereof.

3. A communication system as claimed in claim 2, 25 characterised in that the torque generating apparatus comprises a first assembly (10, 25) including a generally cylindrical member of magnetically soft material and having a longitudinal axis, a second assembly (2) arranged coaxially within the first assembly and including an electromagnetic 30 winding (4), the first assembly and the second assembly being rotatable relative to each other about the axis, the arrangement being such that relative rotation between the first and second assemblies induces a magnetic field which generates rotational torque between the first and second 35 assemblies.